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# SCIENCE

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## IRREVERSIBLE DIFFERENTIATION AND ORTHOGENESIS

THE publication in 1919 of the three noble volumes of posthumous works of the late Professor Whitman<sup>1</sup> redirects our attention to the problem of orthogenetic evolution. The evidence here presented may be regarded as demonstrative that in pigeons variations do not occur in all cases at random around fixed modes as unit characters in accordance with the laws of probability, but that they tend to appear in the course of phylogeny in an irreversible series.

Numerous other students of evolution have formulated similar conceptions under the names, orthogenesis, orthoplasy, directive evolution, etc., some of which are referred to by Whitman, and others are cited at length by Baldwin in his book on "Development and Evolution" (New York, 1902). Most of these statements leave much to be desired from the scientific standpoint and they frequently lead to the expressed or implied postulation of metaphysical factors.<sup>2</sup> Nägeli's principle of perfection is of this sort and has not been especially fruitful. Others, like Eimer,<sup>3</sup> though basing their conclusions on extensive critical observation, have allowed themselves to be swept along by controversial

<sup>1</sup> "Orthogenetic Evolution in Pigeons." Posthumous Works of Charles Otis Whitman. Edited by Oscar Riddle. Published by the Carnegie Institution of Washington, 1919.

<sup>2</sup> The term orthogenesis has been applied in a great variety of senses, some of them decidedly mystical. These are summarized by Vernon L. Kellogg in "Darwinism To-day," New York, 1907, pp. 274-288.

<sup>3</sup> Eimer's Leyden address published by The Open Court Publishing Co., Chicago, 1898, under the title, "On Orthogenesis and the Impotence of Natural Selection in Species-Formation," gives a summary of his views with citation of the original sources of his data.